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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: John A. Ewen  
Serial Number: 10/045,462  
Filing Date: November 7, 2001  
Examiner: Ling Sui Choi  
Group Art Unit: 1713  
Title: ALPHA OLEFIN POLYMER PRODUCTS AND  
CATALYST SYSTEMS  
Customer No.: 25264

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*Donna J. Dobson*  
Donna Dobson

September 9, 2004  
Date of Deposit

APPEAL BRIEF

This is an appeal from the decision by the Examiner in the final rejection dated April 9, 2004 rejecting claims 56-61. This Brief is submitted in triplicate with the statutory fee of \$330.00.

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### **Real Party in Interest**

The real party in interest is Fina Research, S.A., a Belgium corporation, as recorded by the assignment dated April 3, 1987, and recorded in the Patent and Trademark Office on May 20, 2000, at Reel/Frame 010820/0091.

### **Related Appeals and Interferences**

There are presently no appeals or interferences directly related to this appeal.

### **Status of Claims**

The claims pending in this application upon filing of the Notice of Appeal were claims 37-78. Claims 67-78 are withdrawn from consideration. Claims 37-55 and 62-66 are allowed. Claims 56-61 are appealed and are reproduced in Exhibit A.

### **Status of Amendments**

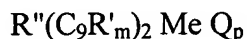
No Amendment was filed subsequent to the Final Rejection.

### **Summary of the Invention**

The present invention involves a metallocene-produced polypropylene having physical properties different from the polymer of the prior art because of the different ligand structure of the metallocene catalyst used to produce the polymer product. The polymer product comprises an isotactic polymer produced by the polymerization of propylene in the presence of a particular metallocene catalyst which incorporates a chiral bridged and hydrocarbyl substituted bis-indenyl ligand structure. The invention is based on the concept that the isotactic polymer produced by the polymerization of propylene in the presence of the chiral stereorigid metallocene can be varied in its physical characteristics, specifically melting point and molecular weight, by changes in the bridge between the indenyl groups, or by changes in the hydrocarbyl substituents on the indenyl groups which control the number of inversions in the isotactic polymer chain (page 1,

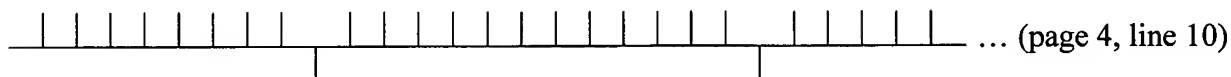
lines 1-17). As the number of inversions is increased (the isotacticity is decreased), the molecular weight and melting point of the polymer decrease (page 10, lines 1-20; page 23, lines 1-4, 11-20).

The metallocene catalyst employed in producing the isotactic propylene polymer has a bis-indenyl ligand structure and is characterized by the formula:



In this formula,  $C_9R'_m$  is an indenyl group substituted with at least one  $C_1 - C_{20}$  hydrocarbyl group  $R'$ ,  $R''$  is a  $C_1 - C_4$  alkylene radical or a silicon hydrocarbyl group, which provides a bridge between the substituted indenyl groups,  $M$  is a titanium, zirconium or hafnium transition metal, and  $Q$  is a halogen or a  $C_1 - C_{20}$  aryl, alkyl, alkenyl, alkylaryl or arylalkyl group.  $m$  is from 1 to 4 and  $p$  is 2.

The isotactic polypropylene of the type involved in the present invention is characterized by a polymer structure in which the methyl groups attached to the tertiary carbon atoms of the successive propylene monomer units lie generally on the same side of the main chain of the polymer. Isotactic polypropylene can be characterized in terms of the so-called Fisher Projection Formula, as indicated by:



In the above formula, the vertical line segments indicate the methyl groups lying above or below the main polymer chain. As indicated by the above formula, the predominant isotactic structure is indicated by the vertical line segments lying above the main polymer chain, with the line segments lying below the polymer chain indicating a few erratic inversions which represent "breaks" in the isotactic polymer chain (page 4, lines 4-7). The number of inversions in the

polymer chain can be controlled by varying the characteristics of the catalyst, specifically the catalyst ligand structure. The ligand structure can be changed by varying the bridge component, R", or by varying the R' substituents on the cyclopentadienyl groups. A change in the number of inversions in the polymer chain results in a change in the molecular weight and melting point of the polymer products (page 10, lines 1-17). Thus, considering two metallocenes based upon bis-indenyl ligand structures which are similar except for the bridge structure or substituents on the indenyl group, one metallocene will produce a polymer which has different physical characteristics than the polymer produced by the other metallocene. For example, consider two metallocenes, metallocene #1 which is a ethylene-bridged bis-indenyl zirconium dichloride and metallocene #2, which is identical to metallocene #1, except that it also has substituents on the indenyl groups. The result of using metallocene #2 in polymerizing propylene is a different polymer product than the polymer product produced by using metallocene #1. As shown by the experimental work catalogued in Table 1 (pages 20 and 21) of applicant's specification, all other things being equal, the more bulky ligand structure (resulting from substituents on the indenyl groups) will produce a polymer of lower molecular weight and lower melting point than the polymer produced by the corresponding, but unsubstituted, bis-indenyl ligand structure (page 22, line 19 – page 23, line 4).

In specific embodiments of the invention, the bridge R" may be a methylene group, an ethylene group, or a dimethyl silyl group. The R' substituents on the bis-indenyl ligand structure may be methyl, ethyl, propyl, butyl, amyl, isoamyl, hexyl, isobutyl, heptyl, octyl, nonyl, decyl, cetyl, cyclohexyl or phenyl groups (page 11, lines 28-33).

### **Prior Art**

The prior art relied upon in rejecting the claims is as follows:

U.S. Patent No. 4,769,510 to Kaminsky et al.

### **Issues**

The issue in this appeal is whether each of claims 56-61 is anticipated under 35 U.S.C. §102(e) by the patent to Kaminsky et al., that is, whether the polymers disclosed in Kaminsky are identical to those claimed.

### **Grouping of Claims**

The claims do not stand or fall together. In addition to arguments applicable to all of the claims on appeal, additional arguments are presented with respect to claim 58 and claims 59-61 dependent therefrom.

### **Appellant's Arguments**

Claims 56-61 are rejected in the Final Rejection as anticipated by Kaminsky by referring to the rejection as previously made in paragraph 7 of Paper No. 8, the Office Action of September 24, 2003 and for additional reasons set forth in paragraph 4 of the Final Rejection. The rejection based upon Kaminsky as set forth in paragraph 7 of Paper No. 8 references column 1, lines 63-67 and column 2, lines 1-19 of the Kaminsky patent. Here, the Kaminsky patent refers to an unsymmetrical mononuclear or polynuclear compound with reference to a formula incorporating ligand structures A<sup>1</sup> and A<sup>2</sup>, which are identified as denoting an indenyl group or a substituted cyclopentadienyl group with reference made particularly to 4,5,6,7-tetrahydro-1-indenyl. It is important to recognize that the Kaminsky patent does not disclose a substituted indenyl group where the substituent is a hydrocarbyl radical. With respect to the Kaminsky patent and the disclosure therein at column 1, lines 63-67 and column 2, lines 1-19, it is noted

that the Kaminsky patent, to the extent it discloses a ligand structure bridged with a linear C<sub>1</sub> – C<sub>4</sub> hydrocarbyl radical, is directed to an unsymmetrical hydrocarbon radical. While the Kaminsky disclosure goes on to state that A<sup>1</sup> and A<sup>2</sup> may be identical, Kaminsky nevertheless characterizes the ligand structure as being unsymmetrical. In any case, Kaminsky does not disclose an indenyl group which is substituted with at least one hydrocarbyl radical as set forth in appellant's independent claim 56. In this respect, the reference to substituted groups in Kaminsky is with reference to cyclopentadienyl groups and not indenyl groups. This is further reinforced by the examples in Kaminsky and the Kaminsky claims, which are directed to ethylene-bis(4,5,6,7-tetrahydroindenyl) zirconium dichloride. Applicant's claim 56 and the claims dependent thereon, specify an isotactic polymer made by the polymerization of propylene in the presence of a bridged metallocene incorporating an indenyl group which is substituted with at least one hydrocarbyl radical having from 1 to 20 carbon atoms. Thus, Kaminsky clearly does not anticipate appellant's invention, which specifies an isotactic polymer produced by a chiral stereorigid metallocene incorporating a ligand structure in which the indenyl groups are substituted with at least one hydrocarbyl radical. In fact, to modify the teachings of Kaminsky to arrive at appellant's invention would be directly contrary to the teachings of the reference in which an unsubstituted indenyl group is used as an alternative to the substituted cyclopentadienyl group.

While the original rejection (Paper No. 8) of claims 56-61 as anticipated by Kaminsky appeared to argue that the same metallocenes as called for in appellant's claims were also found in Kaminsky, the rejection as found in the Final Action backs off from this position in relying upon *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). In the Final Rejection, it is apparently acknowledged that the metallocene called for in appellant's claims is

not disclosed in Kaminsky, but relying upon *In re Thorpe*, the Examiner suggests that the polymer product in Kaminsky would be the same as appellant's polymer product, notwithstanding that the Kaminsky product polymer is made by a different metallocene.

There is no basis in the prior art to support the proposition that the polymer product made by Kaminsky and the polymer product made by using appellant's metallocene as set forth in claim 56 would be identical. Appellant's invention is based on the proposition that changes in the ligand structure of a metallocene can result in different polymer products. In Kaminsky, isotactic polypropylene having a very high isotactic index, 99% or greater, is achieved in connection with the polymer product of very narrow molecular weight distribution. This is accomplished in Kaminsky with a ligand structure, for example the ethylene bis(4,5,6,7-tetrahydroindenyl) zirconium dichloride which is not substituted with a hydrocarbyl radical. Appellant's specification discloses and establishes through the experimental work presented therein, that changes in the bridge structure or substituents on the metallocene ligand structure result in differences in the polymer product. Thus, there is nothing in the first instance to support any sort of presumption that the polymer produced by the Kaminsky metallocene, which, if it incorporates a bis-indenyl ligand would be unsubstituted, would be the same as the polymer produced in accordance with appellant's invention by a metallocene having a bis-indenyl ligand which is substituted. Moreover, it is evident that the polymers claimed here and the polymers in Kaminsky are different. In appellant's specification, the isotacticity of the polymer is indicated by the percent of inversions in a xylene insoluble isotactic fraction which remain after the xylene soluble atactic polymer has been removed. Thus, it is clear that the isotactic polymer produced in accordance with appellant's invention has an isotacticity substantially below the 99% level

disclosed in Kaminsky. Thus, there is no reason to presume that the polymers produced by Kaminsky are the same as the polymers called for in appellant's claims.

It is noted that the issue here is one of anticipation under §102 and not one of obviousness under 35 U.S.C. §103. Accordingly, the issue is not whether the polymer called for in appellant's claim is obvious in view of the Kaminsky polymer, but instead, whether it is identical to the Kaminsky polymer. It clearly is not. Moreover, there is simply nothing in Kaminsky which would lead one of ordinary skill in the art to attempt to employ a substituted indenyl ligand structure in order to arrive at a polymer in accordance with appellant's invention.

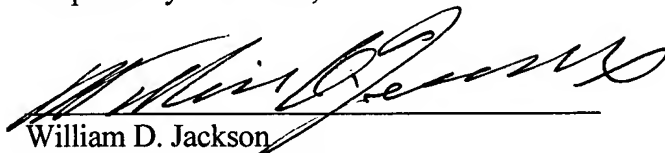
Claim 58 depends from claim 57, specifying a methylene or ethylene bridge, and further specifies a hydrocarbyl radical selected from a group consisting of methyl, ethyl, propyl, butyl, amyl, isoamyl, hexyl, isobutyl, heptyl, octyl, nonyl, decyl, cetyl, cyclohexyl, and phenyl. As noted previously, Kaminsky fails to disclose a polymer produced by a metallocene in which the bis-indenyl group is substituted with a hydrocarbyl radical and it is clear that the Kaminsky reference does not disclose a polymer product produced by a metallocene incorporating a substituent group as set forth in claim 58, and further incorporating a methylene or ethylene bridge. The only ethylene-bridged metallocene disclosed in Kaminsky, as noted above, has a tetrahydroindenyl ligand structure. This ligand structure does not incorporate a hydrocarbyl radical as specified in claim 58. Moreover, while there is no issue of obviousness presented by the Final Rejection, it is clear that there is nothing in Kaminsky which would render obvious to one of ordinary skill in the art a polymer product produced by the polymerization of propylene in the presence of metallocene as set forth in claim 58.

**Conclusion**

For the reasons advanced above, it is respectfully submitted that claims 56-61 are not anticipated by Kaminsky. Accordingly, it is respectfully requested that the final rejection of claims 56-61 be reversed.

The Commissioner is hereby authorized to charge the Locke Liddell & Sapp LLP Deposit Account No. 12-1781 for any fees due in connection with this communication.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "William D. Jackson", is written over a horizontal line.

William D. Jackson  
Registration No. 20,846

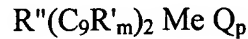
Date: Sept 9, 2004

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### Exhibit A

The claims on appeal are as follows:

56. A polymer product comprising an isotactic polymer produced by the polymerization of propylene in the presence of a catalyst system comprising a transition metal component in the form of a chiral, stereorigid metallocene having the formula:



wherein  $(C_9R'_m)$  is an indenyl group which is substituted with at least one hydrocarbyl radical  $R'$  having from 1-20 carbon atoms;  $R''$  is an alkylene radical having 1 to 4 carbon atoms which acts as an interannular bridge between the  $(C_9R'_m)$  groups or is a silicon hydrocarbyl which acts as an interannular bridge between the two  $(C_9R'_m)$  groups; Me is a transition metal selected from the group consisting of a titanium, zirconium, and hafnium; Q is a hydrocarbon radical selected from the group consisting of aryl, alkyl, alkenyl, alkylaryl, and arylalkyl radical having 1-20 carbon atoms or is a halogen; m is from 1 to 4; and p is 2.

57. The polymer product of claim 56 produced by the polymerization of propylene in the presence of said metallocene in which  $R''$  comprises a methylene or ethylene bridge between the  $(C_9R'_m)$  groups.

58. The polymer product of claim 57 produced by the polymerization of propylene in the presence of said metallocene in which at least one  $R'$  hydrocarbyl radical is selected from the group consisting of methyl, ethyl, propyl, butyl, amyl, isoamyl, hexyl, isobutyl, heptyl, octyl, nonyl, decyl, cetyl, cyclohexyl, and phenyl.

59. The polymer product of claim 58 produced by the polymerization of propylene in the presence of said metallocene in which Me is titanium and Q is chlorine.

60. The polymer product of claim 58 produced by the polymerization of propylene in the presence of said metallocene in which Me is hafnium and Q is chlorine.

61. The polymer product of claim 58 produced by the polymerization of propylene in the presence of said metallocene in which Me is zirconium and Q is chlorine.